necrosis of the tissues and of the exudate at the point of inoculation in animals which had been immunized, and a greater activity of the leucocytes as phagocytes was noted in such animals. Similar results followed the inoculation of the vaginal mucous membrane of guinea-pigs.

As the result of his experiments, Gabritschewsky arrives at the following conclusions:

1. The leucocytosis of diphtheria is materially different from that of the other infectious diseases which have been investigated in that particular.
2. Hyper-leucocytosis is in diphtheria a distinctly unfavorable sign, and, consequently, valuable indications as to the progress of a case and the efficiency of any particular plan of treatment may often be gained from examination of the blood.
3. The diphtheria bacilli which find their way into the body are destroyed by the phagocytic action of the leucocytes.
4. The majority of the diphtheria bacilli concerned in the production of the lesion of diphtheria are cast off in the false membrane; only a very small number are disposed of by phagocytosis.
5. The action of the poison of diphtheria in inducing necrosis of cells tends to lessen the power of the leucocytes to act as phagocytes.
6. The action of antitoxic serum is to make all the cells of the body more resistant to the destructive action of the diphtheritic poison.

ON MIXED INFECTION IN DIPHTHERIA.

The frequent association of the *streptococcus pyogenes* with the specific germ of diphtheria in the false membrane of that disease has been quite generally recognized by those who have carefully investigated its etiology, but its exact significance when thus associated has been uncertain. The fact that it produces, not infrequently, a croupous inflammation of the pharyngeal mucous membrane closely resembling in its clinical aspects that of true diphtheria is certainly suggestive that, at times, its *rôle* in diphtheria may be an important one.

With a view to throwing light upon this question, BERNHEIM (*Zeitschr. f. Hygiene u. Infectionskrankhtn.*, 1894, xviii. 529) has made a careful clinical and experimental study of the part played by the associated bacteria, basing his observations upon eleven cases of diphtheria. The streptococcus longus, streptococcus brevis, and staphylococci were found associated with Loeffler's bacillus in ten, eight, and six cases respectively, several of these species being present in a number of the cases. Animal inoculations showed the virulence of these germs to be very different in different cases, and as the number of them present and their virulence bore no definite relation to the severity of the cases Bernheim concludes that, from a bacteriological examination alone of the false membrane, but little information is to be gained as to the severity of any particular case.

Of special interest, however, is that part of the paper which relates Bernheim's attempt to determine by experiment the part played by the associated bacteria.

Associated bacteria, he says, may act in one or both of two ways upon the specific bacteria of a disease. They may accelerate or inhibit their growth or they may increase or diminish their virulence. It is evident that their effect will be important when they both accelerate the growth and increase the virulence of the specific germ. In his experiments with mixed bouillon-cultures of the bacillus diphtheriæ and the streptococcus Bernheim found that, while after a time the streptococcus died out, the diphtheria bacillus seemed to be stimulated to a rather more rapid and abundant growth than that which occurred when that germ was cultivated alone in the same medium. The growth of the diphtheria bacillus was also abundant in bouillon in which the streptococcus had been grown, but from which it had been removed by filtration. No similar effect was found to be produced by the staphylococci.

The virulence of the diphtheria bacillus appeared to be also increased by the presence of the streptococcus, but not so much so in cultures as when both germs were inoculated simultaneously. Thus, guinea-pigs without exception suffered more pronounced lesions, and died more quickly when both germs were inoculated than when Loeffler's bacillus alone was introduced. In this particular, also, the action of the staphylococcus was found to be different, for in several of the experiments the effect of the diphtheria bacillus seemed to be distinctly lessened by simultaneous injection of the staphylococcus.

That this more intense action of the diphtheria bacillus and streptococcus when inoculated together was not simply due to the fact that two species of virulent germs simultaneously produced their noxious effects was shown by the fact that cultures of the bacilli grown in streptococcus bouillon (from which all streptococci had been removed by filtration) were also found to possess a higher degree of virulence than similar cultures in bouillon in which streptococci had not been grown. It would thus appear that the virulence of the diphtheria bacillus is distinctly increased by the presence of the products of streptococcus growth.

In one of his cases Bernheim found the pseudo-diphtheria bacillus in association with Loeffler's, and it occurred to him that this germ might acquire virulence in the presence of the streptococcus; but all efforts to accomplish such a change by cultivation with the streptococcus and in bouillon containing streptococcus products were fruitless, a new point of difference between the true and the pseudo-diphtheria bacillus being thus developed.

With a view to determining the frequency of the occurrence of associated bacteria in the internal organs, REICHE (*Centralbl. f. innere Médicin*, 1895, xvi. No. 3) has examined the bodies of forty-two patients who died of diphtheria. In 64.3 per cent. of the cases either streptococcus or staphylococcus, or both, were present, and in 45.2 per cent. the streptococcus was present alone. In one case, that of a child who died on the second day of the disease, streptococci were obtained from the internal organs, demonstrating the rapidity of their penetration into the tissues.

THE PRESERVATION OF URINARY SEDIMENTS.

The following method of preserving urinary sediments is described by FISCHEL (*Prager medicin. Woch.*, 1895, No. 12) as superior to those which have heretofore been in use.

After collection of the sediment by settling, or by means of the centrifugal machine, it is twice washed with distilled water to remove the urine as completely as possible. It is then covered by a mixture of equal parts of glycerin and distilled water to which about 2 per cent. of a saturated alcoholic solution of thymol has been added.

As tested by Fischel, all manner of formed urinary sediments were preserved in this way for ten weeks in their original size and shape. They may, furthermore, be stained before preservation by the aniline dyes or hæmatoxylin.

Aside from its value to the teacher as a means of preservation of urinary and other formed pathological products, Fischel believes that such a method is of value to the clinician in that it enables him to make a comparison of the urinary exudate from time to time during the course of a nephritis, and thus to form a better opinion as to the progress of the disease.

COMPARISON OF THE BERKEFELD AND CHAMBERLAND-PASTEUR FILTERS.

DACHNJEWSKI (*Wratsch*, 1893, No. 19) has made a careful comparison of the Berkefeld and Chamberland-Pasteur filters as regards their efficiency as bacterial filters. In all particulars, except that it was somewhat more rapidly penetrated by the bacteria, the Berkefeld showed decided superiority. The Chamberland filter removed all bacteria from ordinary hydrant-water for from three to four weeks, while the Berkefeld was penetrated by them in from seven to ten days. The Berkefeld, however, filtered more than twice as rapidly, and is much cheaper. It is, therefore, strongly recommended as a filter for use in private houses and in hospitals.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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AND

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THE ETIOLOGY OF TYPHOID FEVER.

In an address delivered before the Fourteenth Congress of the Sanitary Institute, held at Liverpool in September, KLEIN (*Brit. Med. Journal*, Oct. 13, 1894) concisely rehearses the argument in favor of the etiological relationship of the *bacillus typhosus* to typhoid fever, expressing himself unequivocally against the theory of Roux, Vallet, Arloing, Kellog, and others, that the typhoid bacillus is nothing more than the *bacillus coli communis* which has